HATCHERY EVALUATION REPORT

Cascade Hatchery - Coho

December 1996

Integrated Hatchery Operations Team (IHOT)

HATCHERY EVALUATION REPORT

CASCADE HATCHERY - COHO

An Independent Audit Based on Integrated Hatchery Operations Team (IHOT) Performance Measures

Prepared by:

Montgomery Watson
2375 130th Avenue NE
Suite 200
Bellevue, WA 98005

Prepared for:

U.S. Department of Energy
Bonneville Power Administration
Environment, Fish and Wildlife
P.O. Box 3621
Portland, OR 97208-3621

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Section 1

Executive Summary

This report presents the findings of the independent audit of the Cascade Hatchery - Coho program. Cascade Hatchery is located along Eagle Creek near the town of Cascade Locks, Oregon. The hatchery is used for adult holding, spawning, incubation, and rearing of coho.

The audit was conducted in 1996-1997 as part of a 2-year effort that will include 67 hatcheries and satellite facilities located on the Columbia and Snake River system in Idaho, Oregon, and Washington. The hatchery operating agencies include the U.S Fish and Wildlife Service, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, and Washington Department of Fish and Wildlife.

Background

The audit is being conducted as a requirement of the Northwest Power Planning Council (NPPC) "Strategy for Salmon" and the Columbia River Basin Fish and Wildlife Program. Under the audit, the hatcheries are evaluated against policies and related performance measures developed by the Integrated Hatchery Operations Team (IHOT). IHOT is a multi-agency group established by the NPPC to direct the development of new basinwide standards for managing and operating fish hatcheries. The Bonneville Power Administration (BPA) contracted with Montgomery Watson to act as an independent contractor for the audit.

IHOT has established five basic policies that cover: (1) hatchery coordination, (2) hatchery performance standards, (3) fish health, (4) ecological interaction, and (5) genetics. The audit focuses on all these policies, with the exception of hatchery coordination. These policies are set forth in *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1995)*. That document is the source for the performance measures that are the basis of this audit.

The Audit Process

The audit was based on the facility management's response to a 109-page questionnaire. This audit form was completed through a five-step process in which:

- Information was obtained from headquarters.
- The hatchery manager was asked to fill out and return the audit form.
- A 1-2 day site audit visit was conducted to inspect facilities, review hatchery records, discuss audit form responses, and develop remedial action plans.
- A compliance report was developed to document the compliance status of each performance measure. This report was then shared with the hatchery manager and IHOT representative.
- This hatchery evaluation report was written to document compliance with IHOT performance measures and develop cost estimates for remedial actions when needed.

Cascade Hatchery - Coho Results

The Cascade facility includes one ponds for adult holding, 30 concrete raceways, and incubation facilities. Cascade Hatchery was authorized under the Mitchell Act and began operating in 1959 as part of the Columbia River Fisheries Development Program - a program to enhance declining fish runs in the Columbia River Basin.

The Cascade Hatchery - Coho program was in general compliance with most of the performance measures. In the area of program objectives, the hatchery was not meeting its adult return goal, pre-spawning survival goal, and did not have a smolt-to-adult goal. The audit found that the hatchery was not in compliance with the water quality monitoring, alarm, pathology-free water, acclimation (Umatilla River releases) requirements, which are all facilities requirements. Approximately 6 more raceways are needed to meet the density criteria. The hatchery was not following all food preparation, feeding, and transportation protocols. The hatchery did not have specific incubation and rearing standards or smoltification goals. The hatchery did not have a Genetics Monitoring and Evaluation Program in place.

The specific areas in which the Cascade Hatchery - Coho program requires remedial actions based on the IHOT performance measures are listed below. These remedial actions are listed in alphabetical order without intent of ranking or otherwise assigning priority:

- Construct 6 more raceways
- Develop alarm log
- Develop genetics M&E Program
- Develop groundwater supply for disease-free water
- Develop smolt-to-adult survival goal for IHOT Operations Plan
- Develop smoltification goal and implement monitoring program
- Develop written incubation standards for IHOT Operations Plan
- Develop written rearing standards for IHOT Operations Plan
- Follow IHOT feeding protocols
- Follow IHOT recommendations for equipment and rain gear sanitation
- Follow IHOT recommendations for monitoring of food preparation
- Follow IHOT transportation protocols
- Install flow alarms for adult holding, security alarms, and pager system
- Install second set of screens
- Provide acclimation for Umatilla River releases
- Rebuild adult holding ponds
- Review IHOT temperature criteria; may need well for tempering
- Review Operations Plan with staff
- Review potential for providing rearing in Yakima and Umatilla subbasins
- Run analysis for alkalinity and hardness
- Run analysis for contaminants
- Run analysis for dissolved nitrogen
- Run analysis for nitrite
- Run analysis for turbidity
- Run water chemistry analysis

Non-compliance issues resulting from items beyond human control or Performance Measures not relevant to this hatchery (Type 1 in Table 3, Section 4 of this report) were not listed above.

Section 2

Facility Description

Name: Cascade Hatchery

Stock/Species: Coho
Fall Chinook (adults are sometimes collected at this facility and used for backup for other programs)

Operating Agency: Oregon Department of Fish & Wildlife

Funding Agency: Mitchell Act

Location: Cascade Hatchery is located along Eagle Creek near the town of Cascade Locks, Oregon

Address: Cascade Fish Hatchery
Oregon Department of Fish & Wildlife
Star Route B, Box 12
Cascade Locks, OR 97014

Hatchery Manager: Mr. Alan Meyer

Phone: (541) 374-8381
Fax: (503) 374-8191

Purpose: Cascade Hatchery was authorized under the Mitchell Act and began operating in 1959 as part of the Columbia River Fisheries Development Program - a program to enhance declining fish runs in the Columbia River Basin.

The goal of the hatchery is to produce coho to help meet the goals the Columbia River Fisheries Development Program (U.S. v. Oregon Agreement)

Production Goal: **Coho**

Produce 700,000 coho smolts (46,665 lb) for release into the Yakima River.

Produce 1,000,000 coho smolts (66,670 lb) for release into the Umatilla River System.

Provide 1,587,000 coho eggs to Oxbow Hatchery

Produce 2,100,000 coho fingerlings (14,000 lb) for transfer to Upper Herman Creek Ponds (Oxbow Hatchery)

Produce 500,000 coho fingerlings (20,000 lb) for transfer to Lower Herman Creek Ponds (Oxbow Hatchery).

Total Production: 147,335 lb

Water Supply:

Water is supplied by gravity from Eagle Creek. The total water right is 20,197 gpm and the average water usage is about 7,117 gpm.

Facilities:

Adult Holding:	1 concrete adult holding pond - 22,50 cf
Incubation:	12 deep troughs - 22 cf each
	28 shallow troughs - 9 cf each
Early Rearing:	12 deep troughs - 22 cf each
	28 shallow troughs - 9 cf each
Raceways:	30 concrete raceways - 3,120 cf each
Rearing Ponds:	none
Satellite Facilities:	none

Section 3
Compliance Status

The hatchery audits are based on compliance with written IHOT performance measures. These performance measures are documented in ***Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries*** (referred to as *IHOT 1995* in this report).[1] The purpose of the performance measures is to implement new basinwide policies that provide regional guidelines for operating anadromous hatcheries in the Columbia Basin.

The audit focuses on performance measures for IHOT policies that cover (1) hatchery performance standards, (2) fish health, (3) ecological interaction, and (4) genetics. These performance measures are intended to guide hatchery operations once production is established. For that reason, the hatchery operations audit included broodstock collection, spawning, incubation of eggs, fish rearing and feeding, fish release, equipment maintenance and operations, and personnel training. Production priorities are beyond the scope of this audit.

Based on *IHOT 1995*, a detailed 109-page audit form was developed. The audit form divided the performance measures into six major sections along major program and technical criteria areas. Two additional sections (sections 1 and 8) include general information and expenditure information needed for this Hatchery Evaluation Report and blank forms for additional comments. The following is the basic structure of the IHOT audit form:

Section 1	Performance Measures for General Information and Expenditure Information (PMs General 1-2)
Section 2	Performance Measures for Program Objectives (PMs 1-4)
Section 3	Performance Measures for Facility Requirements (PMs 5-15)
Section 4	Performance Measures for Hatchery Practices (PMs 16-25)
Section 5	Performance Measures for Fish Health Policy (PMs 26-34)
Section 6	Performance Measures for Ecological Interactions (PMs 35-38)
Section 7	Performance Measures for Genetics Policy (PMs 39-43)
Section 8	Blank Forms for Additional Comments

Several performance measures are repeated in various sections of the audit form. These performance measures overlap in *IHOT 1995* and were retained to allow individuals interested in specific portions of the audit (such as Genetics or Fish Health) to determine the compliance status of all performance measures for a given topic in one location. A repeated performance measure is indicated by shaded text.

The Hatchery Audit Process

The hatchery audit will be conducted over a 2-year period that concludes in 1997. At each hatchery, a five-step process was used to complete the overall hatchery audit.

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[1]Integrated Hatchery Operations Team (IHOT) 1995. *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries*, Bonneville Power Administration, Portland, Oregon.

This process consisted of research and onsite visits. The site visit at the Cascade Hatchery was conducted on October 30, 1996.

The following is the five-step audit process:

1. Information was obtained from headquarters.

2. The hatchery manager was asked to fill out and return the **Audit Form**.

3. A 1-2 day site audit visit was conducted at each hatchery. During that visit an audit team inspected facilities, reviewed hatchery records, discussed audit form responses, and developed remedial action plans when appropriate.

4. During the site visit, the compliance status of each performance measure was discussed with the hatchery manager and IHOT representative. A portion of the Hatchery Evaluation Report was sent to the hatchery manager following the audit visit as a **Compliance Report**. That Compliance Report is Table 2 of this report.

5. Information from steps 1-4 was used to prepare a draft **Hatchery Evaluation Report**. This draft report was submitted to the operating agencies for review of the information used to determine compliance. Based on review and comments, a final Hatchery Evaluation Report was developed. The final report documents the compliance of a particular hatchery with the IHOT performance measures and presents cost estimates to correct any deficiencies.

Compliance Status of Cascade Hatchery - Coho

The following table includes information on life-stages that are held on this facility for some portion of their rearing cycle (Table 1). For multi-facility programs, summary cost and contribution data is presented at the facility where rearing occurs. For the compliance status relating to performance measures that do not occur at this hatchery, please refer to the Hatchery Evaluation Reports for the hatcheries and stocks listed in Table 1. A check mark (✔) indicates that the specific life-stage is held at this facility.

This section documents the compliance status of the Cascade Hatchery - Coho program. Each performance measure is presented in a table taken from the audit form (Table 2). The compliance status is identified by the following categories:

- **N/A** (not applicable)
- **Yes** (in compliance)
- **?** (unknown; generally due to unavailability of information to determine compliance)
- **No** (not in compliance).

Remedial actions are suggested for performance measures not in compliance. These remedial actions are grouped into categories and listed in Section 4 of this report, where the cost of the required remedial actions is also presented.

Table 1 Summary Program Information for Cascade Hatchery - Coho

Component	Location of Adult Holding, Spawning, Incubation, and Rearing					
	Bonneville Hatchery	Cascade Hatchery	Oxbow Hatchery	Yakima River	Umatilla River	Lower Columbia River net pens
Adult Collection	✔					
Adult Holding		✔				
Spawning		✔				
Fertilization		✔				
Incubation						
green-to-eyed		✔				
eyed-to-hatch		✔	✔			
Rearing						
fry		✔	✔			
fingerlings		✔	✔			✔
smolts	✔	✔				✔
Acclimation/release	✔			✔	✔	✔

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
the hatchery programs outlined in a subbasin nagement plan?		✔			Columbia Basin System Planning Production Plan U.S. v. Oregon; Mitchell Act	
ne hatchery operating under a current hatchery rational plan?		✔			IHOT Operations Plan and Annual Production Schedule	
s it understood by staff?			✔			Review Operations Plan with staff
s it being followed?			✔			Review Operations Plan with staff
hatchery monitoring and evaluation plan in place?					CWT program. Need to review contributing hatcheries data	
Do you have a written monitoring and evaluation plan?		✔				
ult contribution to fisheries, spawning grounds, and chery		✔			Review of records	
ult pre-spawning survival as compared with blished goal				✔	Review of records; in compliance 2 out of last 5 years	Rebuild adult holding pond
-take as compared with established hatchery goal				✔	Review of records; in compliance 3 out of last 5 years	Improve adult pre-spawning survival and adult return
en-egg to eyed-egg survival as compared with blished goal		✔			Review of records; in compliance 3 out of last 3 years	
d-egg to fry survival as compared with established l		✔			Review of records; in compliance 3 out of last 3 years	
to smolt survival as compared with established goal		✔			Review of records; in compliance 3 out of last 3 years	
duction as compared with established goal				✔	Review of records; in compliance 2 out of last 3 years	Improve adult returns
cent survival (smolt to adult) as compared with blished goal			✔		No goal set	Develop smolt-to-adult survival goal for IHOT Operations Plan
nber of eggs, fry, fingerlings, smolts, and/or adults neet basinwide needs	✔				Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
nperature						
Does your water temperature meet the criteria for spawning?				✔	Review of temperature data for Eagle Creek. Above 49°F early, below 40°F late.	Review temperature criteria, may need well for tempering.
Does your water temperature meet the criteria for ncubation?				✔	Too cold.	See above
Does your water temperature meet the criteria for earing?				✔	Too cold.	See above
solved gases						
s the oxygen level near saturation?		✔			Review of data	
s the dissolved nitrogen level less than saturation?			✔		No data/No problems observed	Run analysis for dissolved nitrogen
emistry						
mmonia (un-ionized)			✔		No data	Run appropriate analyses for Eagle Creek supply
Carbon Dioxide			✔		No data	See above
Chlorine			✔		No data	See above
H			✔		No data	See above
Copper			✔		No data	See above
Hydrogen Sulfide			✔		No data	See above
ron			✔		No data	See above
inc			✔		No data	See above
bidity						
Does your turbidity meet the criteria?			✔		No data	Run analyses for Eagle Creek supply

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
alinity and hardness						
)oes your alkalinity and hardness meet the criteria?			✔		No data	Run analyses for Eagle Creek supply
:ite						
)oes your nitrite meet the criteria?			✔		No data	Run analyses for Eagle Creek supply
:ontaminants						
,ldrin			✔		No data	Run analyses for contaminants
,ndrin			✔		No data	See above
)ieldrin			✔		No data	See above
Heptachlor			✔		No data	See above
:hlordane			✔		No data	See above
Methoxychlor			✔		No data	See above
,indane			✔		No data	See above
Malathion			✔		No data	See above
;uthion			✔		No data	See above
hogens						
Vhat portions of the hatchery have disease-free water?						
Adult holding				✔		
Incubation				✔	Surface water supply from Eagle Creek up to 60 gpm from springs can run 5 incubation troughs	Develop groundwater supply for disease-free water source
Early rearing				✔		
Rearing				✔		
Others				✔		

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
rm Systems						
)o the following areas have alarms?						
Intake		✔			Inspection of facilities/Discussion	
Large rearing ponds and adult holding ponds				✔	Inspection of facilities/Discussion	Install alarm
Raceway headboxes and rearing ponds		✔			Inspection of facilities/Discussion	
Incubation facilities		✔			Inspection of facilities/Discussion	
Quarantine areas and facilities	✔				Discussion	
Water treatment systems	✔				Discussion	
Security				✔	No problems	Install security alarms
ıre there outside systems and buzzers in onsite esidences?		✔			Discussion	
ıre water flow alarms checked daily?		✔			Review of records/Discussion	
ıre all other alarms checked weekly?		✔			Discussion	
; there a log of alarms for emergencies, tests, and ıaintenance requirements?				✔	Discussion	Develop alarm log
ıre telephone pagers used?				✔	Inspection/Discussion	Install pager system
ılt collection and holding facilities						
)o you meet the adult holding criteria?		✔			Review of data and criteria	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ıbation facilities						
'ype 1: Deep Trough)o you have an adequate number of units for the verall program?		✔			Inspection of facilities/Discussion	
'ype 2: Shallow Troughs)o you have an adequate number of units for the verall program?		✔			Inspection of facilities/Discussion	
ıring facilities						
'ype 1: Raceway)o you have an adequate number of units for the verall program?				✔	Exceed density criteria at times	Provide more (20%) raceway capacity and well system to moderate temperatures
'ype 2: _____)o you have an adequate number of units for the verall program?		✔				
'ype 3: _____)o you have an adequate number of units for the verall program?	✔					
eening facilities						
)o you meet the approach velocity criteria?		✔			Inspection of facilities/ODF&W data	
ıre the fish screens regularly cleaned?		✔			Inspection of facilities/ODF&W data	
)oes the screen mesh meet screen opening criteria?		✔			Inspection of facilities/ODF&W data	
ıre rearing containers double screened for fish that hould not be released to adjacent water?				✔	Inspection of facilities/ODF&W data	Install second set of screens
dator control facilities						
ıre your predation control facilities effective?		✔			Inspection of facilities	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
d storage facilities and quality control						
)oes the storage of dry/semi-moist/moist foods dry<12%; semi-moist 12-20%; moist >20% moisture) ollow food manufacturer's recommendations?		✔			Inspection of facilities/Discussion	
)oes a regional quality control officer oversee roduction procedures and monitor:						
Verification by feed manufacturer that ingredients meet specifications?				✔	Discussion with ODF&W regional quality control (QC) officer	Follow IHOT recommendations for monitoring of food preparation
Ensure feed does not contain unwanted drugs or other additives?				✔	Discussion	See above
Analyze ingredients contained in the final food product to ensure that feed specifications have been met?				✔	Discussion	See above
ıre the foods stored and handled according to the ollowing criteria?						
Moist pellets should not exceed 10 °F at point of delivery.		✔			Discussion	
Moist pellets should be removed from freezer just prior to feeding.				✔	Discussion	Follow IHOT feeding protocols
Do not leave buckets of feed or feed containers outside exposed to light or heat.		✔			Discussion	
Open bags of feed should be fed within 1 to 2 days except when feeding small groups of fish.		✔			Discussion	
Automatic feeder hoppers and bulk storage facilities should be insulated against excessive temperatures (80°F and above).	✔				Hand feed	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ease facilities						
)o the release facilities ensure that fish are not ubjected to adverse conditions?	✔				All production is hauled off station for acclimation and release	
lution abatement facilities						
)o the pollution abatement facilities meet all federal nd state regulations (or good engineering practice)?		✔			Inspection of facilities/Discussion	
re pollution abatement facilities operated correctly?		✔			Discussion	
nsportation facilities						
re the transport systems adequate to meet IHOT erformance measures for transportation practices?		✔			Inspection of facilities/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
odstock selection practices						
s the donor selection process document attached? (PM 40a)	✔				Existing program; does not apply	
Was the donor selection outline followed in selecting ne hatchery broodstock? (PM #40b-c)	✔				Existing program; does not apply	
wning practices						
Were the appropriate number of spawners, male/female atios, and fertilization protocols used? (PM #42c-g)		✔			Review of records/Discussion	
ıbation practices						
specific incubation standards listed in the hatchery rations plan?				✔	Nothing provided to team	Develop written incubation standards for IHOT Operations Plan
incubation practices written?				✔	See above	See above
ıbation Type 1: Deep Troughs (see PM #8) you meet the loading and flow criteria?		✔			Review of records/Discussion	
ıbation Type 2: Shallow Troughs (see PM #8) you meet the loading and flow criteria?		✔			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ıring practices						
specific rearing standards listed in the hatchery rations plan?				✔	Nothing provided to team	Develop written rearing practices and standards for IHOT Operations Plan
rearing practices written?				✔	Review Hatchery Operations Plan	See above
earing Unit Type 1: Raceways (see PM #9)						
Do you meet the density and DI criteria?			✔		No criteria	See above
Do you meet the Loading and FI criteria?			✔		See above	See above
earing Unit Type 2: see PM #9)						
Do you meet the density and DI criteria?						
Do you meet the Loading and FI criteria?						
earing Unit Type 3: (see PM #9)						
Do you meet the density and DI criteria?						
Do you meet the Loading and FI criteria?						
olt quality						
Do you produce a high quality smolt?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
n health management practices						
re the monthly hatchery monitoring visits being onducted? (PM #26)		✔			Review of records/Discussion	
re the annual broodstock inspections being conducted? PM #27)		✔			Review of records/Discussion	
s there pathogen-free water (PM #5h) and are the anitation procedures being followed? (PM #28)				✔	No pathogen-free water	Provide pathogen-free water
re the following water quality parameters within riteria? (PM #5a-5g)						
Water temperature				✔	Review of records	Review temperature criteria
Dissolved gases			✔		Review of records	Run analysis for TGP
Chemistry			✔		Review of records	Run analysis
Turbidity			✔		No data	Run analysis
Alkalinity and hardness			✔		No data	Run analysis
Nitrite			✔		No data	Run analysis
Contaminants			✔		No data	Run analysis
re rearing standards being followed? (PM #19)				✔	No written standards	Develop written rearing standards
re egg and fish transfer/release requirements met? PM #31)		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
s hatchery performance meet requirements lined in the regional hatchery policies and in basin and hatchery plans for the following areas?						
cent smoltification						
)o you measure percent smoltification?				✔	Discussion. Not measured	Develop smoltification criteria for IHOT and implement measurement program
)id you meet the smoltification criteria?			✔		Discussion	See above
ıring density (prior to release)						
)id you meet the rearing density criteria just prior to elease?				✔	Discussion	Develop written rearing density criteria
ease condition (at release)						
)id you meet all disease regulations just prior to elease?		✔			Discussion	
nber (at release)						
)id you meet the release number goal?				✔	Review of data/Discussion	Improve adult pre-spawning survival and adult returns
: at release						
)id you meet the size goal?				✔	Cold water a problem in meeting size goal.	See PM#5a
es of release						
)id you meet the release date goal?		✔			Review of records/Discussion	
ation of release						
)id you release the fish at the specified location?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
fish reared in the subbasin or acclimated in the basin?						
are the fish reared in the subbasin?		✔		✔	Bonneville and net-pen releases yes; others no.	Review potential for providing rearing in Yakima and Umatilla subbasins.
are the fish acclimated in the subbasin?		✔		✔	Bonneville and net-pen releases yes	
Yakima River		✔			Yakima releases yes	
Umatilla River				✔	Umatilla releases not acclimated	Provide acclimation in Umatilla subbasin.
ne release strategy appropriate for the program?				✔	Discussion. Umatilla releases not acclimated.	See PM#22b

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
nsportation facilities						
)o transportation equipment and personnel receive isinfection before and after use?		✔			Discussion	Follow IHOT transportation protocols
s the fish tank interior disinfected using a solution of 00 ppm active chlorine for 30 minutes minimum or ormaldehyde gas generation method (relative humidity f 60% for 2 hrs)?		✔			Discussion	
Is the exterior of the fish transport vehicle disinfected using high pressure steam (115-130°C), high temperature acid, or with 200 ppm chlorine for 30 minutes?				✔	Discussion	See above
s the fish transport vehicle (cab) disinfected using 600 pm quaternary ammonia compounds (1.5 ml of 50% tock solution/liter water)?				✔	Discussion	See above
s other equipment disinfected including fish pumps, ets, egg sorters, waders, boots, rain gear, hoses and ther equipment using one of the following solutions?				✔	Discussion	See above
200 ppm chlorine for 30 minutes 600 ppm quaternary ammonia compound for 30 minutes 200 ppm iodophor solution for 10 minutes				✔	Discussion	See above
)o personnel wear protective garments when handling sh eggs or cultural water?				✔	Discussion	See above
)o the fish transport truck/chassis and tank/unit receive n inspection and service prior to the release season?		✔			Discussion	
s a daily service inspection completed before starting p and leaving for the day?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
nsportation facilities						
)oes the fish transport unit receive an inspection prior) loading?		✔			Discussion	
)oes a pre-loading inspection covering tank water evel, pumps or aerators, oxygen injection system ettings, displacement gauge, and truck loading/hauling ensity tables checked and reviewed occur prior to)ading fish in the transport unit?		✔			Discussion	
)o hauling criteria include checking the fish 45 minutes) 1 hour after loading?		✔			Discussion	
Vhen fish are active and systems are functioning roperly, is the oxygen concentration reduced and ıaintained at approximately 8 ppm?				✔	Discussion	Follow IHOT transportation protocols
; water temperature in the transportation unit ıaintained within the 42-48 °F range?				✔	Discussion/Use water at hatchery	See above
)o fish releasing procedures include the following riteria?						
Releasing the fish at the correct release site or into the correct water body.		✔			Discussion	
Tempering or the difference between the liberation tank and the target water body should not exceed 10°F.		✔			Discussion	
The liberation hose should be angled so that fish gently hit the water. Using a tripod is a method of ensuring the hose will stay at the proper angle.		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
luation practices						
las the hatchery conducted fishery contribution studies o:						
Determine the requirements for evaluating and improving management programs?		✔			CWT Tagging program	
Develop guidelines that define the geographical area and identify component stocks (hatchery and/or wild) that comprise the management unit?		✔			CWT Tagging program	
Develop guidelines that define if the proper stocks of fish are currently being used?		✔			CWT Tagging program	
Determine which management units contribute to a specific fishery and the time periods of those contributions?		✔			CWT Tagging program	
Determine the relative contributions of the various management units to a specific fishery over the different time periods?		✔			CWT Tagging program	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ining practices						
Does the hatchery have a training schedule for its staff?		✔			Discussion	
Does each staff member have a personal training plan approved by a supervisor and reviewed annually?		✔			Discussion	
Does the hatchery routinely exchange training details between other hatcheries and agencies?		✔			Discussion	
Does the hatchery encourage and reward off-duty training of staff?		✔			Discussion	
Does the hatchery conduct monthly staff meetings?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
monthly hatchery monitoring visits being ducted by a qualified fish health specialist as cribed below?						
Conduct visit at least monthly		✔			Based on review of regional lab	
Monitoring conducted by qualified fish health specialist		✔			Based on review of regional lab	
Examine a representative sample of healthy and moribund fish from each lot.		✔			Based on review of regional lab	
Review fish culture practices with hatchery manager.		✔			Based on review of regional lab	
Report finding and results of necropsies on standard form.		✔			Based on review of regional lab	
Recommend appropriate drug or chemical treatment.		✔			Based on review of regional lab	
Summarize fish health status or stock prior to release or transfer to another facility.		✔			Based on review of regional lab	
all of the functions of the hatchery yearly nitoring visits being completed as described below?						
Annually examine each broodstock for the presence of reportable viral pathogens.		✔			Review of procedures at regional lab/Discussion	
Annually screen each salmon broodstock for the resence of *Renibacterium salmoninarum*.		✔			Review of procedures at regional lab/Discussion	
Conduct inspection by or under the supervision of ualified fish health specialist.		✔			Review of procedures at regional lab/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
he hatchery following accepted sanitation cedures?						
Are there any sources of pathogen-free water, especially or incubation and early rearing?				✔	Limited 60 gpm spring water for incubation	Develop groundwater supply for pathogen-free water
Are the hatchery sanitation procedures understood and eing followed as described below?						
Disinfect/water harden eggs in iodophor?		✔			Discussion	
Are foot baths containing disinfectant placed at the incubation facility's entrance and exit?				✔		Follow IHOT recommendation for equipment and rain gear sanitation
Is equipment and rain gear utilized in broodstock handling or spawning sanitized prior to its use elsewhere in the hatchery?				✔		See above
Is equipment used to collect dead fish sanitized prior its use in another pond and/or lot of fish?				✔		See above
Is equipment, including vehicles used to transfer fish between facilities, disinfected prior to use with any other fish lots or at any other location?		✔			Discussion	
Are rearing vessels sanitized after fish are removed and prior to introducing a new fish lot or stock?		✔			Discussion	
Are dead fish properly disposed of?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
water quality parameters being followed?						
re the following water quality parameters within riteria? (PM #5a-5g)						
Water temperature				✔	Exceeds criteria for spawning	See PM #5a
Dissolved gases			✔		No data	See PM #5b
Chemistry			✔		No data	See PM # 5c
Turbidity			✔		No data	See PM #5d
Alkalinity and hardness			✔		No data	See PM #5e
Nitrite			✔		No data	See PM #5f
Contaminants			✔		No data	See PM #5g
o to PM #21						
incubation and rearing standards being followed?						
Are the incubation practices following the IHOT incubation criteria? (PM #18)				✔		Develop written incubation and rearing practices
Are the rearing practices following the IHOT criteria? (PM #19)				✔		Develop written incubation and rearing practices
o to rearing practices PM #18-PM #19						
egg and fish transfer/release requirements met?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ne hatchery's program outlined in a subbasin nagement plan? Go to subbasin plan PM #1		✔			Columbia Basin System Planning Production Plan and U.S. v. Oregon; Mitchell Act	
ne hatchery operating under a current hatchery rational plan? Go to operational plan PM #2		✔			Review IHOT Operations Plan and Annual Production Schedule	
hatchery monitoring and evaluation plan in place? Go to hatchery monitoring and evaluation plan PM #3		✔			M&E program described in IHOT Operations Plan CWT Program	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
s the hatchery program meet requirements blished in the regional hatchery policies and basin planning documents in the following areas: cies, stock, broodstock collection location, odstock numbers, broodstock collection strategy, spawning and egg-take protocols?						
Does the hatchery program meet the requirements for he following?						
Species protocols (PM #4a)		✔			Discussion	
Stock protocols (PM #4a)		✔			Discussion	
Broodstock collection location protocols (PM #41b)	✔				At Bonneville	
Broodstock numbers protocols (PM #42c)	✔				See above	
Broodstock collection strategy protocols (PM #41b-d)	✔				See above	
Spawning protocols (PM #42d-e)		✔			Discussion	
Egg-take protocols (PM #42f-g)		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
s the hatchery's performance meet requirements ined in the regional hatchery policies and in basin and hatchery plans for the following areas: cent smoltification, rearing density, disease dition, and the number, size date(s), and location of ase?						
ercent smoltification (PM #22a1)				✔	No written criteria	See PM #22a1
earing density (PM #22a2)				✔	No written criteria	See PM #22a2
isease condition (PM #22a3)		✔			Discussion	
umber at release (PM #22a4)				✔	Discussion	See PM #22a4
ize at release (PM #22a5)				✔	Discussion	See PM #5a
ate of release (PM #22a6)		✔			Discussion	
ocation of release (PM #22a7)		✔			Discussion	
fish reared in the subbasin or acclimated in the basin?		✔				
Yakima River				✔	Discussion	
Umatilla River					Discussion	Build acclimation ponds
PM #22b						
e release strategy appropriate for the program?		✔		✔	Discussion	See PM #22c
PM #22c						

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
new programs, has a broodstock collection plan n developed?						
s the broodstock collection plan written?	✔				Existing Program; does not apply	
or a non-captive broodstock program:	✔				Existing Program; does not apply	
Was an unbiased, representative sample collected?						
Was the recommended number of broodstock collected?	✔				Existing Program; does not apply	
or a captive broodstock program:						
Were captive brood progeny excluded as donors for propagating the next generation of the captive broodstock program?	✔				Existing Program; does not apply	
Were full-sib crosses avoided?	✔				Existing Program; does not apply	
s the broodstock collection plan understood and being ollowed by staff?	✔				Existing Program; does not apply	
a new program, was the donor selection outline owed in selecting the hatchery broodstock?						
s a donor selection plan written?	✔				Existing Program; does not apply	
Was the donor selection outline followed in selecting ne broodstock?	✔				Existing Program; does not apply	
Was the target stock recommended in the donor election process actually used?	✔				Existing Program; does not apply	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
existing programs, were the broodstock collection cedures followed?						
s the broodstock collection plan written?	✔				At Bonneville	
Does the broodstock collection plan follow the uideline:						
Was an unbiased, representative sample collected?	✔				See above	
Was the recommended number of broodstock collected?	✔				See above	
Were the broodstock collection procedures in hatchery operation plan understood and followed?	✔				See above	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
s the appropriate number of spawners, male/female os, and fertilization protocols used?						
ıre the spawning protocols written?		✔			Review of IHOT plan/Discussion	
ıre daily or weekly spawning logs available?		✔				
Vas the appropriate number of spawners used?		✔			Review of IHOT plan/Discussion	
)id you attempt to spawn all collected broodstock and ındomize mating with respect to age class, and other ·aits?		✔			Review of IHOT plan/Discussion	
Vas the sex-ratio within the limits given in the erformance standards?		✔			Review of IHOT plan/Discussion	
Vere the fertilization protocols followed?		✔			Review of IHOT plan/Discussion	
: the hatchery needed to reduce the number of eggs ·tained, was this done by representative sampling of ach male/female cross?	✔				Review of IHOT plan/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ıere a genetics monitoring and evaluation program lace?						
; a genetics monitoring and evaluation program vailable?				✔		Develop genetics M&E program
)oes the plan address the following elements listed in HOT:						See above
Does the program have elements needed to meet evaluation goals 1-4?				✔		See above
Has a qualified geneticist reviewed and endorsed the program (goal 5)?				✔		See above
Will the program collect the data and maintain the records needed to evaluate compliance on an ongoing basis (goal 5)?				✔		See above
Is the program understood and followed by staff?				✔		See above

Section 4

Remedial Actions

Based on the compliance status for each performance measure, remedial actions were developed. The required remedial actions are organized into five categories. The types of categories range across a spectrum from those actions that are beyond human control, to those that require a change in agency policy or procedures, to those that involve a significant capital cost to put in place. The following are the five types of remedial actions identified under phase 1 of the audit:

The Five Types of Remedial Actions

Type	Description
1	Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery
2	Remedial actions requiring changes in agency policies or procedures
3	Remedial actions requiring changes in monitoring coverage or interval
4	Remedial actions requiring significant capital expenditures
5	Remedial actions that may require significant capital expenditures but are not clearly definable at this time

Remedial Actions at Cascade Hatchery - Coho

This section presents the corrective actions required to bring the Cascade Hatchery - Coho program into compliance with IHOT performance measures. The remedial actions suggested here are just that, suggestions developed by the Montgomery Watson Audit Team. For some non-compliance areas, other remedial actions could be proposed. The required remedial actions are cross-referenced to each IHOT performance measure that was not in compliance. Where appropriate, the costs associated with the remedial actions are also presented (Table 3).

The cost estimates presented in this section are based on professional experience from similar projects. In most cases, only a lump-sum figure is presented, and detailed take-off lists have not been prepared. The cost estimates are essentially order of magnitude estimates (± 40%).

More importantly, the suggested remedial activities may also present several levels of action. Optional actions have been listed for several problems. These optional actions are desirable for either operational or safety considerations.

Table 3. Remedial Actions Required at Cascade Hatchery - Coho

Remedial Action Required	Cost	PMs[1]
Type 1 - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery		
Improve adult returns	----	4c, 4g
Type 2 - Remedial actions requiring changes in agency policies or procedures		
Review Operations Plan with staff	----	2
Develop smolt-to-adult survival goal for IHOT Operations Plan	----	4h
Review IHOT temperature, may need well for tempering	----	5a, 22a5
Develop alarm log	----	6
Follow IHOT recommendations for monitoring of food preparation	----	12
Follow IHOT feeding protocols	----	12
Develop written incubation standards for IHOT Operations Plan	----	18
Develop written rearing standards for IHOT Operations Plan	----	19, 22a2
Develop smoltification goal and implement monitoring program	----	22a1
Use existing acclimation ponds for Umatilla River releases	----	22b, 22c
Follow IHOT transportation protocols	----	23
Follow IHOT recommendations for equipment and rain gear sanitation	----	28
Develop Genetics M&E Program	----	43
Type 3 - Remedial actions requiring changes in monitoring coverage or interval		
Run analysis for dissolved nitrogen	----	5b
Run water chemistry analysis	----	5c
Run analysis for turbidity	----	5d

[1] PMs are performance measures that were extracted from the IHOT 1995 report. The IHOT performance measures are listed in Table 2 (Section 3 of this report) in numerical order.

Type 3 (Continued) - Remedial actions requiring changes in monitoring coverage or interval		
Run analysis for alkalinity and hardness	----	5e
Run analysis for nitrite	----	5f
Run analysis for contaminants	----	5g
Type 4 - Remedial actions requiring significant capital expenditures		
Rebuild adult holding ponds	$410,000	4b
Install flow alarms for adult holding, security alarms, and pager system	$20,000	6
Construct 6 more raceways	$450,000	9
Install second set of screens on 30 raceways	$9,000	10
Type 5 - Remedial actions that may require significant capital expenditures but are not clearly definable at this time		
Develop groundwater supply for disease-free water		5h
Review potential for providing rearing in Yakima and Umatilla subbasins	----	22b
Provide acclimation for Umatilla River releases	----	22b

Section 5

Hatchery Contribution to Fisheries, Spawning Grounds, and Hatcheries

This section presents the audit findings for the Cascade Hatchery - Coho program contribution of adult fish to fisheries, local fisheries, spawning grounds, and hatcheries. Data is reported by broodyear. A broodyear refers to the adult contribution from the eggs produced from a single group of spawning adults. For some species, this may include fish caught as 2-, 3-, 4-, 5-, and 6-year old fish. Because of the return distribution and data processing delays, the complete adult contribution for a given broodyear may not be available until 4 to 5 years after the fish have been released from the hatchery.

Table 4. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries: Cascade Hatchery - Coho

Year	Fisheries[1] (Broodyear)	Spawning Grounds (Broodyear)	Hatchery (Broodyear)	Total Combined Contribution[2] (Broodyear)	Smolt to Adult Survival (percent)
1982					
1983					
1984					
1985					
1986					
1987				3323	0.75%
1988				17634	1.25%
1989				1762	0.11%
1990				4849	0.47%
1991				462	0.03%
1992					

[1] Data obtained from Missing Production Groups Annual Report or from the Regional Mark Information System database.

[2] Total combined adult contribution; presented when it is not possible to subdivide the contribution into fisheries, spawning grounds, and hatchery contributions; contribution based on Umatilla and Yakima rivers releases.

Section 6

Annual Operating Expenditures

The level and detail of annual operating expenditures varies widely depending on hatchery, operating agency, and funding source. When provided, expenditures were presented in terms of personnel costs, operating costs (power, feed, supplies), capital costs, indirect costs charged to the federal government, third-party costs, and other costs. These cost components were summed to determine a total hatchery annual cost. Based on discussion with the hatchery manager, the percent of total hatchery costs allocated to a given program was estimated. The total hatchery costs and the percent of hatchery costs allocated to a given program were used to compute the cost of a given program. Table 5 shows the annual operating expenses for the Cascade Hatchery - Coho program. For programs that occur at more than one facility (as shown on Table 1 in Section 3 of this report), the cost breakdown for the component(s) at each facility is presented in separate tables (Table 5a).

Table 5. Annual Operating Expenses: Cascade Hatchery - Coho

Hatchery	1994	1995	1996
1. Cascade Hatchery	$431,945	$382,188	$355,577
2. Oxbow Hatchery	$61,589	$34,095	$27,782
3.			
4.			
5.			
Total Program Costs	**$493,534**	**$416,283**	**$383,359**

The total expenditures for the Cascade Hatchery are presented in Table 6 by program. The detailed breakdown of program expenditures at this hatchery are presented in separate tables (Table 6a).

Table 6. Annual Operating Expenses - Cascade Hatchery

Program	1994	1995	1996
1. Coho	$431,945	$382,188	$355,577
2.			
3.			
4.			
5.			
Total Hatchery Costs	**$431,945**	**$382,188**	**$355,577**

Table 5a. Annual Operating Expenses: Cascade Hatchery - Coho

Expenditure Occurring at Cascade Hatchery

Component	1994	1995	1996
Personnel Costs	$217,151	$214,780	$172,717
Operational Costs	$141,474	$102,442	$129,677
Capital Costs	$7,800	$5,856	$0
Indirect Costs	$65,520	$59,110	$53,183
Lumped Hatchery Costs[1]			
Lumped Third-Party Costs	$0	$0	$0
Total Hatchery Costs	**$431,945**	**$382,188**	**$355,577**
Source of Funds			
Program Production (lb)			
Total Production (lb)			
Program as Percent of Total	100%	100%	100%
Program Costs	**$431,945**	**$382,188**	**$355,577**

[1] When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

Table 5b. Annual Operating Expenses: Cascade Hatchery - Coho

Expenditure Occurring at Oxbow Hatchery

Component	1994	1995	1996
Personnel Costs	$198,941	$190,665	$185,401
Operational Costs	$156,758	$90,519	$57,624
Capital Costs	$15,821	$2,890	$20,842
Indirect Costs	$68,399	$56,878	$44,825
Lumped Hatchery Costs[1]			
Lumped Third-Party Costs	$0	$0	$0
Total Hatchery Costs	**$439,918**	**$340,952**	**$308,692**
Source of Funds			
Program Production (lb)	13,553	13,466	13,133
Total Production (lb)	91,627	125,332	142,229
Program as Percent of Total	14%	10%	9%
Program Costs	**$61,589**	**$34,095**	**$27,782**

[1] When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

Table 6a. Detailed Expenditures at Cascade Hatchery by Program

Coho

Component	1994	1995	1996
Personnel Costs	$217,151	$214,780	$172,717
Operational Costs	$141,474	$102,442	$129,677
Capital Costs	$7,800	$5,856	$0
Indirect Costs	$65,520	$59,110	$53,183
Lumped Hatchery Costs[1]			
Lumped Third-Party Costs	$0	$0	$0
Total Hatchery Costs	**$431,945**	**$382,188**	**$355,577**
Source of Funds			
Program Production (lb)			
Total Production (lb)			
Program as Percent of Total	100%	100%	100%
Program Costs	**$431,945**	**$382,188**	**$355,577**

[1] When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.